The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

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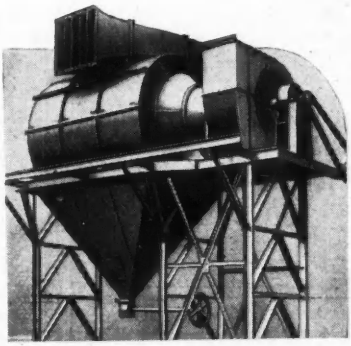

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Our Pathway

THE Presidential Address which Mr. Garland gave to the Institution of Chemical Engineers contained much that will repay study and gave voice to many things that needed saying. We share in Mr. Garland's pleasure that the Prime Minister in his broadcast address on post-war problems stated that private enterprise is to be encouraged. The British character and achievement have been built upon the spirit of adventure. Thus did the seafaring rovers and the merchant venturers lay the foundations of our Empire, of our foreign trade and of such power and wealth as we now enjoy; thus they "smote for us a pathway to the ends of all the Earth." We must not allow ourselves to be deluded by the specious arguments of politicians into following any other path.

Mr. Garland went farther. He condemned much of the planning that is now so fashionable. There are certain things that can be planned, such as the type of house that should be built, but the danger is that over-planning will dam the mainsprings of progress. Who can tell in what direction scientific research will progress? If the planners had the free hand they want there would be no room for progress because the way of trade and social development would be marked out in advance, on the basis of existing knowledge, and none could deviate from it. Our future, like our past, lies in the Spirit of High Adventure, but whereas past adventure was expressed in the venturesomeness of the Elizabethans, adventure in the 20th century is primarily the adventure of scientific research and its applications. That, as Mr. Oliver Lyttelton remarked in his speech at the luncheon, is where the technician and the scientist are essential. The future is theirs, and upon our success in this direction depends our place in the world.

Was it not always so? The part played by the scientist and the thinker has been obscured by more strident voices, but it is more enduring. That we think otherwise is due to the faulty basis of our education. This view has been well expressed in a recent article by J. C. Tinsley (*Chambers' Journal*, April, 1943), and a passage from this source is worth quoting: "Ever since the dawn of the history of mankind, ever since man first began groping towards the light, becoming articulate, discovering the possibilities of wheels, and later the science of agriculture and the method of

On Other Pages

building, so long have there been, at irregular intervals, minds which could carry humanity forward by greater stages or smaller. And at each stage the rest of mankind, the passengers, have waited, generally without any display of enthusiasm, for the next lift. . . . For civilisation is not made by those who win great battles, nor by those who sit on thrones. These are among the passengers: very lively and interesting passengers, but passengers none the less. Yet it is of these passengers, of their comings and goings, their marriages and their squabbles, that we must read at school. . . . It is like a play without a plot, and we search in vain for the connecting threads and the vital, motivating forces." The minds that can change the world to-day are not those of politicians, or captains and kings, but those of the scientist and the inventor.

We cannot leave it at that. We must provide the facilities for research and development and the personnel to carry on the work. There is no need to look forward to an era of ruthless competition with other nations after the war, but undeniably every nation will need to export, and however amicable may be the international arrangements for regulating trade, there will still be competition between firms. Mr. Garland, by insisting on the continuance of private enterprise, clearly visualised this state of affairs. We shall get our full share of the export trade only in so far as we are as efficient as our competitors and give our customers what they want. How far can private enterprise do this unaided? We suggest for Mr. Garland's consideration that private enterprise must be on a new basis of co-operation between firms engaged in similar operations. The day, we believe, is past when single firms playing a lone hand can keep up with world progress even in their own specialised lines of technical development. We do not know whether Mr. Garland would subscribe to that, since he insisted that the small business must be allowed to live and grow. Perhaps the divergence is more apparent than real. In established manufactures there is less chance for the small business, and still less for the small business playing a lone hand. But in new developments it may well be that only the small business can make a start.

It is well to pursue this matter of competition a little deeper. What constitutes competitive power? We believe that it is essentially the technical progress made by an industry. This technical progress consists of two parts. One is the performance of established operations in the most efficient manner. This requires training of the employees and of the supervising engineers—perhaps also the provision of many more supervising engineers. The second part of technical progress is that of developing new and improved processes. What are we doing here in this country? Have we a sufficient number of men engaged in research? Have we proper machinery for developing the discoveries made? For the purpose of argument let us select the U.S.A. as the nation that we shall have to compete against in the technological industries; there will be others, but the argument can be crystallised by singling out one. Dr. Cullen pointed out, in seconding the vote of thanks to the President for his address, that he had found that the number of students taking chemical engineering in American universities was nearly as great as the *combined* numbers of those taking civil, mechanical and electrical engineering. That is a rather staggering fact. The greatest single advantage, in fact, that the U.S.A. has over us is the extent and power of the research weapon. Statistics show that whereas there were only 300 research laboratories in the U.S.A. in 1920, to-day there are over 2000, employing some 75,000 scientific workers. We have nothing like that in this country. How then can we compete against a nation that has not only greater natural resources, but greater scientific development?

We suggest that the Institution of Chemical Engineers should take a lead in putting us "on the map." The gas industry has shown us how that can be done. The Institution of Gas Engineers has been charged with the research work of the industry in the past, and has been financed by the whole gas industry, plant manufacturers and gas makers alike. Cannot the Institution take the lead by approaching the A.B.C.M. and the B.C.P.M.A. to formulate comprehensive schemes for research and for education of workers and for training of executives?

NOTES AND COMMENTS

More Trained Scientists

ALTHOUGH he was speaking to a convention of radio teachers, Sir Stafford Cripps did not refer only to the science of radio when he said last week that we must have more university-trained scientists if we are to re-establish our position in world industry after the war. He drew an adverse comparison between the number of university students in this country and the corresponding figure in the United States, as well as commenting on the comparative niggardliness of the amount of money spent on them here. "If we compare our position in this matter with other great countries," he said, "we can realise how much remains to be done. Before the war the number of university students in this country was just half the number of whole-time staff in American universities, and one-twentieth of the number of students in the United States." This means that with a total university income of £6,500,000, against £100,000,000 in the U.S., we are spending roughly one-fifth as much on one-sixth as many students per head of population. The exact means by which we are to attain the necessary great expansion of highly-trained personnel, he went on to say, needs to be worked out in detail, but it is obvious that we should be prepared now for a start soon after the war. When the details do come to be studied, we should like to put in a plea for the system of interchange of students between the university and the workshop, as perhaps the quickest way of making the transfusion of new scientific blood effective in stimulating industry.

Colossal Figures

NOTHING strikes the commentator as more extraordinary than that he should have to say that there were no surprises in Sir Kingsley Wood's Budget, that the performance was unsensational and almost humdrum, and that his new proposals are assured of as easy a passage as any in the records of the British Treasury. For this was, measured in pounds, shillings, and pence, the most colossal Budget ever submitted to the House of Commons. Estimated expenditure in the coming year, the taxation to be imposed to meet it in great part, the borrowing which would be necessary to make up the balance, and the total of the national indebtedness, all were the highest on record. If the direct taxpayer was left alone it was because the yield from this source had already reached virtually the limit of its productivity. So, for the second year in succession, the indirect taxpayer was called upon to take the whole of the additional strain. He will no doubt grin and bear it, but it is a superb vindication of the traditional methods of British finance, based on a free system of private enterprise, that it should have been found possible to raise another £100,000,000 from the nation's luxuries and other forms of consumption not strictly necessary to the maintenance of life and health. Where the Budget proposals were disappointing was in the Chancellor's failure to take a forward step towards the release of industry from burdens the maintenance of which seriously prejudices it in any quick transition from war to peace conditions. Sir Kingsley Wood did, indeed, indicate one or two minor adjustments of the E.P.T. position, but he or his successors have a long way to go before industry and commerce can be satisfied of their ability to regain the vast export area which has been lost in the war years, and which must be regained and even expanded if the nation in future is to maintain its customary standard of living.

The Keynes Scheme

A MERE twenty pages suffices for the White Paper in which Lord Keynes sets down the outlines of his scheme for an International Clearing Union. The proposals are offered as a basis for discussion, criticism, and constructive amendment and are well worth reading, indeed, should be read by every business man. The scheme suggests that the benefits which each nation enjoys from an internal banking system may be extended to the whole world by the establishment of a universal bank. That is where it begins and the suggestion calls at once for the obvious comment: an internal banking system is designed to suit the purposes of depositors and borrowers each of whom is subject to the law of the land, and each of whom can,

in face of default or dispute, be brought before the courts of justice. An international bank, by way of contrast, will have to deal with sovereign nations outside the power of any court and themselves the supreme judges of their own actions. Lord Keynes is thus driven to threats and penalties which are at least reminiscent of the Sanctions of the League of Nations. The outstanding feature of these proposals is the new coin or unit of value to be known as the Bancor or, if the American counterpart of the Keynes scheme finds more favour, the Unitas. Little pains are taken to explain the need for a new currency at all. When it is a matter of exchanging pounds, dollars, pesos, and the rest, the introduction of yet another currency would seem to complicate rather than simplify that class of transaction. So far in the history of modern civilisation the pound sterling, even since the days of the gold standard, has had pride of place among the currencies of the world, and it would seem wise to be careful before setting up a currency which, from its nature, must take precedence over all others. The new bancor, by an ingenious suggestion likely to be the subject of much debate, is to establish a novel sort of one-way traffic in gold. Lord Keynes proposes that while gold may be exchanged into bancors the reverse operation is not to be permitted.

International Clearing Union

THE International Clearing Union visualised as a bank will start just like any other bank by opening its doors and inviting deposits. The amount of the deposits as well as of the overdrafts is limited by an elaborate scheme of quotas based upon imports, exports, and other statistical considerations. If nations with favourable balances can be persuaded to deposit those balances with the new bank, then practical operations will become possible. It has yet to be discovered, however, whether the necessary confidence will exist from the start to induce any such deposits. Nations in difficulties are to be given overdraft facilities limited by quotas calculated as before, and so the I.C.U. becomes a means of receiving surpluses from nations that have them for the purpose of providing loans to nations in need. Whether or not the accommodation required by distressed nations will provide the class of security properly required by depositors has yet to be discussed. Enough has perhaps been said to tempt the reader to study the report for himself. As will be expected, having regard to its authorship, this plan, like other plans, requires a considerable extension of the bureaucracy and of bureaucratic powers. There will not only be in every nation an exchange control, but also a system of fixed exchange rates. Merchants with experience of the fixing of rates in the last 25 years may be pardoned for doubting the efficacy of these arrangements to promote the flow of trade.

Extension of Bureaucratic Control

LORD KEYNES further proposes that Governments should control the movements of capital and in that way tends to strengthen the erroneous belief that it is the habit of capitalists as a class to shift their capital from place to place in pursuit of illicit gains. That sort of thing may happen from time to time, but can never constitute more than an infinitesimal part of the movement of free international trade. With exchange control and a ban on capital movements it is obvious that before the finance of the simplest of export and import transactions can be completed inquisitorial official processes must be satisfied. The author of these proposals is at pains to explain that they do not necessarily involve a number of other similar arrangements, but he does set out further brief particulars of an International Body for World Reconstruction, a supernational Police Force to be financed by the new bank, a Commodity Control Council which will hold buffer stocks, a Board for International Investments, an International Economic Board to control the trade cycle, and an International Development Corporation. Lord Keynes puts forward his proposals as a step to freedom and emphasises the latitude that will be allowed outside the orbit of the International Clearing Union. Critics may be more inclined to believe that, following all precedents in the realm of bureaucratic control, the Union, once established, will step by step strengthen its stranglehold until the business of the whole world is in the hands of the bureaucratic class.

Boiler-Water Treatment—III

Silica Removal : "Internal" Treatment

by D. D. HOWAT, B.Sc., Ph.D., F.I.C., A.M.I.Chem.E.

(*Continued from* THE CHEMICAL AGE, *April* 10, 1943, *page* 392)

A NEW type of boiler scale reported in 1933 proved to be essentially a sodium aluminium silicate, corresponding in some cases to the naturally occurring mineral analcite ($Na_2O.Al_2O_3.4SiO_2.2H_2O$). The ratio of the oxides in this type of scale has been found to vary over a wide range. Clark and Bunn[25] state that in the majority of cases no appreciable amount of alumina is present in boiler scale containing silica. They were able to prove by examination, supported by X-ray data, of a number of scales that two different silicates occurred in the samples analysed, *viz.*, xonotlite ($5CaO.5SiO_2.H_2O$) and pectolite ($Na_2O.4CaO.6SiO_2.H_2O$). Xonotlite may be synthesised by heating together an aqueous mixture of lime and silica which was maintained at a temperature of 150/200° C. for 3½ days. Pectolite may be synthesised in exactly the same fashion, but with the addition of sodium hydroxide.

Danger of Silicate Scale

This work emphasises the possibility of the formation of dangerous silicate scales even in boiler water free of alumina. Intensely hard and brittle, sometimes almost translucent, the scales, in many instances, resemble porcelain. Accumulations of silicate scale on boiler tubes operating at pressures over 400 lb. have presented a grave problem and have caused some serious tube failures. The hard impervious character of silicate scale makes it imperative to reduce to a minimum the amount formed under any conditions. Much greater attention has been paid in the United States than in this country to the question of silica removal. There are two main aspects of the prevention of silicate scale: either the removal of these oxides (lime and alumina) combining with silica to form scale, or the elimination of the silica itself. Silica may find its way into the boiler feed either as very fine clay particles in suspension or in the truly soluble form. Adequate settling and filtration should eliminate the first source, but more extensive and controlled methods are called for with soluble silica. All methods appear to stress that the removal of soluble silica is essentially an adsorption process.

Notes on Removal Systems

The following are notes on some of the suggested means of silica removal. (*a*) *Ferric Sulphate.* If the *p*H of water to which ferric sulphate has been added is maintained close to 9, the ferric hydroxide formed by hydrolytic dissociation adsorbs the soluble silica. Precipitated ferric oxide may also be employed. Although one of the cheapest common methods of silica removal, the employment of ferric sulphate is attended by the following serious disadvantages[26]:—

1. It cannot be used simultaneously with the lime-soda process, which is operated at *p*H 10.5/11.5, so that a two-stage treatment is necessary.

2. Very large doses of ferric sulphate are required to remove the last traces of silica.

3. The large doses of the reagent bring about a very undesirable increase in the quantities of dissolved solids in the water.

4. Ferric sulphate is not so efficient a silica remover as some other but more expensive reagents.

(*b*) *Sodium Aluminate.* The use of this reagent is open to two of the objections stated above. Lindsay and Ryzner[27] state that optimum results are obtained at *p*H 8.3 to 8.7 so that, like ferric sulphate, it cannot be employed directly in the lime-soda process. With careful attention to sedimentation and filtration no increase in the solids content need be experienced. The same workers show that the process is one of adsorption, and that recirculation of the sludge increases the efficiency to a marked degree. Figures given in their paper indicate that on the same water samples sodium aluminate was twice as effective as ferric sulphate, although the actual concentration neces-

sary was only half that of the ferric sulphate used.

(*c*) *The Effect of Alumina.* Betz, Noll, and Maguire[28] have shown that freshly precipitated aluminium hydroxide is quite effective in removing silica by adsorption. The solution gives best results at *p*H 7.6 to 8.0, values in excess of this giving an increase in soluble alumina in the water. Increase in temperature, as commonly experienced in adsorption reactions, causes a loss of efficiency.

(*d*) *Removal by Magnesium Compounds.* The ordinary lime-soda process does effect a slight reduction in the silica content by adsorption of the silica on the magnesium hydroxide.[26 29] Magnesium sulphate may be used in conjunction with the ordinary lime-soda process, the sulphate hydrolysing and liberating hydroxide which acts by adsorption. The advantage of this method is that silica removal occurs at the *p*H of the lime-soda process, *viz.*, 9 to 11. Betz and collaborators[29] show that certain forms of magnesium oxide are particularly effective in silica removal; the most active form, "Remosil," prepared from sea bitterns, gave optimum results in the range *p*H 9.3 to 10.6, a suitable range for use in conjunction with the lime-soda process. Although the results of these investigators may be plotted in the form of an adsorption isotherm, indicating the process to be one of adsorption, the efficiency increases with increase in temperature to 95° C., allowing its employment even in the hot lime-soda process. Magnesium oxide offers one great advantage over ferric and magnesium sulphates in that no increase in total dissolved solids occurs.

Permutit Patent

(*e*) *Filtration through a Bed of Granular Alumina.* Granular activated alumina offers a useful method of silica removal, the procedure possessing one salient feature in the elimination of subsequent sedimentation and filtration. In addition, after a given period, the reagent may be regenerated and used for further treatment cycles. A recent patent, granted to the Permutit Co., Ltd.,[30] calls for the treatment of softened water by a process of this type. The softened water, after the *p*H is regulated to not more than 8, is passed through the bed of activated alumina. Regeneration of the filter bed is effected by washing with dilute mineral acid, followed by alkali until the *p*H of the effluent is about 8.

Conditioning of Boiler Water

All boiler-feed water, with the possible exception of distilled water, will carry a certain degree of hardness, none of the ordinary softening processes being capable of producing a water completely free of traces of residual hardness. Condenser leaks or carry-over from evaporators are other sources of hardness entering the boiler water. Even where a full-scale softening plant has been installed, further conditioning treatment of the feed water is necessary to control or remove the residual hardness, to prevent corrosion of pipes, valves, and fittings, and to inhibit carry-over or priming. In certain circumstances the installation of a preliminary softening plant may not be practicable. Here, treatment of the water must be entirely by the addition of chemicals directly to the water entering the boiler: by "internal boiler-water treatment."

To obtain the best results with maximum output from the boiler and minimum charges the necessary conditioning treatment may be summed up under four essentials: (1) conditioning for the prevention of scale; (2) conditioning for the prevention of caustic embrittlement; (3) conditioning for the prevention of corrosion; (4) conditioning for the prevention of carry-over (or priming). The four points cannot be considered separately, the first, second, and third being closely inter-related as will appear in the discussion.

1. *Conditioning for the Prevention of Scale.* The mechanism of scale formation has not been fully explored. Partridge and Purdy[31] suggest that when a bubble of steam is produced momentarily at a heat-transfer surface, a dry spot forms on the surface underneath the bubble. On this dry spot the chemicals present in solution in the water tend to deposit as a plaque or ring. As the bubble detaches itself the water sweeps over the deposited material. The resolution of this material in the water will depend on two factors; first, if the boiler water is saturated with one of the constituents, then that constituent deposited on the wall will not be redissolved, each successive evaporation of a film of water as a bubble thickening up the deposited

layer; and second, if the material cannot redissolve as fast as it is formed, the surplus will be deposited scale. Certain salts such as calcium sulphate have a negative solubility, *i.e.*, the solubility decreases with rise in temperature. When deposited on the tube-wall calcium sulphate forms a hard closely-adherent scale with very strong heat-insulation properties. Other salts, such as calcium carbonate or phosphate, with very low solubilities, tend to deposit in the form of a highly powdered loosely-adherent sludge. The most obvious method, therefore, of preventing scale formation is to ensure the precipitation of calcium in the form of the highly porous sludges of carbonate or phosphate. Two types of scale are encountered in boilers and the initial steps in conditioning aim at their elimination.

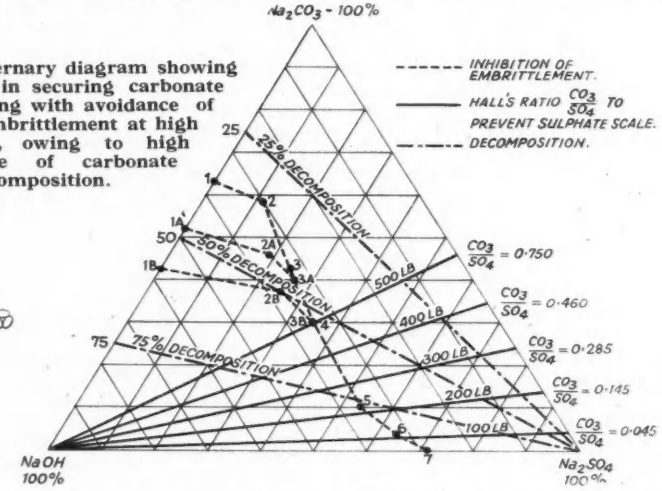

Fig. 8. Ternary diagram showing difficulty in securing carbonate conditioning with avoidance of caustic embrittlement at high pressures, owing to high percentage of carbonate decomposition.

(*a*) *Sulphate Scales.* Sulphate scales are found to consist mainly of calcium sulphate with lesser quantities of calcium carbonate and silica. The most exhaustive work on the conditions for the elimination of sulphate scales was carried out by R. E. Hall. Hall showed that the basis of scale prevention is dependent upon the selection of the correct CO_3/SO_4 ratios. He determined the ratios which should be observed at different pressures and temperatures. When these values are maintained, freedom from precipitation of sulphate scale may be expected. Hall's CO_3/SO_4 ratios for different working pressures which have been embodied in the A.S.M.E. code, are shown in Fig. 8.[32] These values have been proved over a long period of time, though difficulties arise in maintaining the required conditions at boiler pressures over 200 lb. At pressures over 200 lb. sodium carbonate in solution begins to decompose fairly rapidly into sodium hydroxide and caustic soda, until from 70 to 90 per cent. may have been transformed. The A.S.M.E. code calls for higher CO_3/SO_4 ratios at higher boiler pressures, but these increased pressures practically preclude conditioning by means of sodium carbonate. As a further complication the extensive decomposition of sodium carbonate at high boiler pressures gives an alkali content sufficiently high to threaten caustic embrittlement, while the CO_2 evolved with the steam may cause corrosion. Under these high-pressure conditions sodium phosphate is used in preference to sodium carbonate, the phosphate ion (PO_4) being quite stable at high pressures. The use of phosphates in this connection was suggested by R. E. Hall.[33] The difficulties in securing correct carbonate conditioning while avoiding a tendency to set up caustic embrittlement have been shown in the ternary diagram (Fig. 8) prepared by Gerrard.[32] For high-pressure boilers phosphates, although much more expensive reagents, have almost completely replaced carbonate for the prevention of calcium sulphate scale.

With correctly applied phosphate treat-

ment the calcium is precipitated as a sludge of hydroxy-apatite: $3Ca_3(PO_4)_2.Ca(OH)_2$. Clark and Hunter[34] have shown that the solubility of this compound decreases from 0.19 part $PO_4/10^6$ at 150° C. to 0.06 part $PO_4/10^6$ at 300° C. This work also indicates that ratios of PO_4/SO_4, similar to those postulated by Hall for CO_3/SO_4 control of sulphate scaling, cannot be laid down at present and that a sufficient reserve of soluble phosphate should be carried in the boiler to deal with any soluble calcium salts emanating from unexpected sources, such as condenser leaks. Sodium hexametaphosphate (sold sometimes under the trade name of "Calgon") is the salt most commonly employed. With orthophosphate, deposition of calcium phosphate is liable to occur in the feed lines, the metaphosphate not giving this trouble. In the boiler hexametaphosphate transforms rapidly to orthophosphate; 1 lb. of hexametaphosphate in each 100,000 lb. of feed water will precipitate one degree of calcium hardness, leaving a reserve of 3 to 5 parts of PO_4 per 100,000 parts of water. Tannins have been recommended for use in conjunction with the phosphates, the tannins acting as dispersing agents preventing the accumulation of hydroxy-apatite sludge.

(*b*) *Silicate Scales.* Silicate scales are hard, translucent and highly resistant to heat transfer, a thickness of 0.05 in. being sufficient to cause tube failures. The prevention of these scales is largely a matter of removing all soluble calcium salts as sludges by carbonate or phosphate treatment or by the elimination of silica. The various methods suggested for silica removal have already been noted. Where a separate operation for elimination of silica is considered unnecessary, the avoidance of silica scale will be governed entirely by adequate conditioning for the prevention of calcium scale. The existence of any large quantity of uncombined silica in a silicate scale is very rare. The problem of silicate scale formation only becomes acute at pressures in excess of 350 lb./sq. in.

Prevention of Caustic Embrittlement

Apparently brittle failures will occur in the mild steel plate and rivets of apparatus used in the concentration of caustic soda. This fact, well known for many years past, was one of the most direct clues in elucidating the cause of similar failures occurring in boiler plate and gave rise to the misleading term "caustic embrittlement," by which such failures were designated. This type of failure invariably revealed the presence of networks of fine intergranular cracks having their origin at points where high concentration of stresses is likely.

Causes of Embrittlement

The causes and actual mechanism of failure by caustic embrittlement have not by any means been completely revealed. The effect of free caustic alkali was, somewhat naturally, regarded as the first cause, although this material was present in boiler water in quantities very much smaller than those that had given trouble in caustic soda plants. Parr and Straub in the U.S.A. suggested that caustic alkali accumulated in capillary spaces in the boilers in concentrations sufficient to cause the defect. They discovered that sodium sulphate acted as a powerful inhibitor and submitted certain minimum ratios of sulphate/alkali to be maintained in boiler-feed water as a precautionary measure. The ratios recommended (and included in the A.S.M.E. Boiler Code) in which total alkalinity is expressed as sodium carbonate were :—

Boiler Pressure : lb./sq.in.	0-150	150-250	Over 250
Sulphate/Total Alkalinity Ratio	1	2	3

Further research involved the study of the separate ratios of sulphate to hydroxide and sulphate to carbonate.[35] The Prime Movers' Committee of the National Electric Light Association of America have put forward recommendations specifying limiting proportions of sodium hydroxide, sodium carbonate, and sodium sulphate for the prevention of embrittlement. These values are shown as dotted lines in Fig. 8.[32] For prevention of embrittlement the values actually carried in the boiler should fall above or to the right of the particular dotted line corresponding with the working pressure.

Schroeder, Berk, and Partridge[36] showed that the presence of even minute amounts of sodium silicate gravely aggravated the tendency to caustic embrittlement, the silicate appearing to act as a catalyst activating the sodium hydroxide. This work, together with a later paper by Schroeder, Berk, and O'Brien[37], has emphasised the inhibiting power of sodium sulphate in sodium

hydroxide/sodium silicate solutions, although certain anomalies were noted in the results. Curiously enough, sodium phosphate appears to offer very limited protection. Certain inorganic oxidising agents, *e.g.*, sodium chromate and potas-

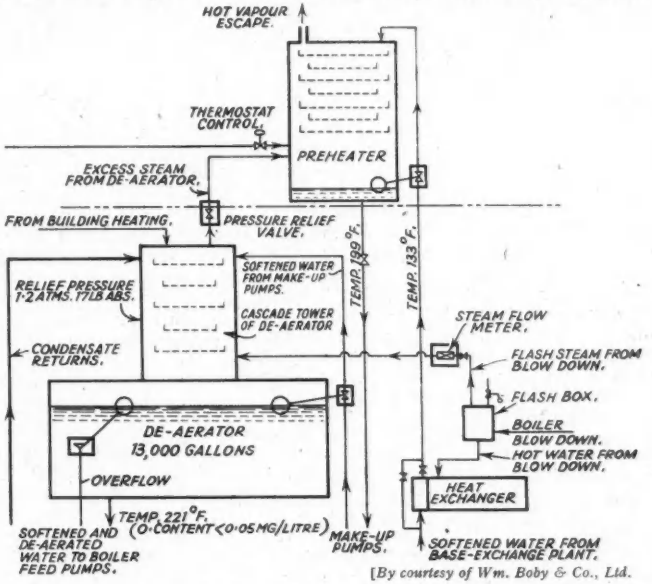

Fig. 9. Pressure deaerator operating in conjunction with preheater using flash steam from boiler blowdown as heat source.

[By courtesy of Wm. Boby & Co., Ltd.

sium permanganate, appear to be quite effective inhibitors. A study was made of the inhibiting effect of organic materials. Cracking of test pieces in sodium hydroxide/sodium silicate solutions was prevented both at ordinary and elevated temperatures by using lignin sulphonate, concentrated sulphite waste liquor, Philippine cutch, or quebracho, all of which are more effective than sodium sulphate.

Schroeder, Berk, and O'Brien[37] state that cracking by caustic embrittlement will occur only when the following three factors apply simultaneously:

1. The boiler water must be of an embrittling character, *i.e.*, containing both sodium hydroxide and sodium silicate.

2. Leakage must take place, allowing concentration of the water in riveted seams, etc.

3. The metal in contact with the concentrated solution must be in a state of stress, internal stresses due to cold work being extremely critical.

Colbeck, Smith, and Powell[38] have shown that in a number of cases cracking of test pieces occurs when using dilute solutions of sodium hydroxide and silicate of the amounts experienced in feed water. They also showed that the tendency to cracking appeared to be greater with poorer quality low carbon steel, containing up to 0.08 per cent. sulphur and 0.10 per cent. phosphorus, than with high-grade steel.

The procedure to be followed is largely a matter for the discretion of the engineer who may adopt:—

1. The sulphate/hydroxide ratio control of Parr.

2. The sulphate/hydroxide and carbonate/hydroxide ratio control of the Prime Movers' Committee.

3. Organic inhibitors as suggested by Schroeder *et al.*

4. The lead of an important school of thought in the U.S.A. concentrating on care in the erection of boiler plant.

Prevention of Corrosion

Boiler-feed water should always be alkaline to phenolphthalein. Where the feed water is the effluent from a lime-soda softener the excess alkali necessary

in the softening process is sufficient to reduce corrosion in feed lines and economisers to a minimum. In cases where the softened make-up represents only a small proportion of the feed, some caustic soda may require to be added to maintain the necessary alkalinity. Dissolved gases, the most important being oxygen and carbon dioxide, are also liable to be a source of corrosion.

At pressures above 300 lb./sq. in. steps must be taken to eliminate the dissolved oxygen, which should be reduced to not more than 0.05 c.c. per litre.[29] Mechanical de-aerators of either the semi-vacuum type or the pressure type may be employed. The pressure type de-aerators are employed in conjunction with high-pressure boiler installation operating with steaming economisers, requiring a feed temperature above 212° F. Messrs. Wm. Boby & Co., Ltd., have adopted the method of using flashed vapour from the continuous blowdown as the steam feed to the de-aerator, the point of entry being at the base of the cascade. Oxygen is removed from the water, which flows through the de-aerator counter-current to the steam. The steam, escaping from the de-aerator, then enters a preheater to raise the temperature of the feed water to that of the condensate return. The temperature of the water leaving the de-aerator is 221° F. (Fig. 9).

At pressures in excess of 450 lb./sq. in. the dissolved oxygen content must be reduced to less than 0.02 cc./litre.[29] Under these conditions mechanical de-aeration has to be reinforced by chemical treatment with sodium sulphite. The bulk of the oxygen is removed by the mechanical de-aerator and sufficient sodium sulphite is added afterwards to maintain in the boiler drum an excess of about 2 to 3 parts of sulphite per 100,000 parts of water. Apart from the corrosion of boilers and tubes the removal of oxygen and carbon dioxide is particularly desirable to prevent corrosion in the superheater. Corrosive action appears to begin during idle periods when the superheater and walls may be wet, oxygen and carbon dioxide in the condensed moisture rapidly causing pitting.

Prevention of Carry-Over

The presence of solids in steam is due to the carry-over of mechanically entrained particles of boiler water. These particles, drying out, may cause deposits in the superheater or on turbine blades. Superheater deposits cause a lowering of heat transfer and a drop in the degree of superheat, while hard particles on turbine blades may result in serious mechanical troubles. Any foaming occurring on the surface of the water in the steam drum will materially aggravate carry-over and is regarded by some authorities as the real cause of the trouble. Suspended solids in the water have frequently been regarded as foam-producing, but the evidence appears very conflicting. Probably the most important factors in foaming are the total dissolved solids, the alkalinity, and oil contamination. The saponification of vegetable oils present in certain lubricating oils are suspect as an important cause of foaming.

The simplest method of conditioning against carry-over is the control of the amount of total dissolved solids by adjustment of the "blowdown." Increasing evidence proves that a continuous blowdown, adjusted to maintain a certain total of solids content in the boiler water, gives the best results, particularly in high-pressure installations. Maximum permissible solids in boiler water at various pressures are suggested by Hamer:[39]

Pressure	*Solids in Parts*/100,000
Up to 250 lb.	1000/1500
200-500	500/700
Above 500	150/200

Taking these figures as a basis, the amount of blowdown required may be calculated when the total dissolved content of the feed water is known.

The author desires to thank Mr. W. Vincent Boby, of Messrs. Wm. Boby and Co., Ltd., for much useful information and for permission to reproduce the drawing shown in Fig. 9.

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Safety for those New to Industry

by JOHN CREEVEY

THE man who takes up his first post at a chemical works has much to observe and to learn concerning safety. If he comes direct from a course of training at some college or technical institute, he finds the atmosphere of the works very different from that of the laboratory, where he has gained his practical experience of chemistry and of the engineering aspects of chemical processes. Hitherto he has worked only on a laboratory or a semi-manufacturing scale; in the latter case with equipment which was not only simplified in design, but also built to meet the needs of the student, and most likely housed under ideal conditions so that the various features were better accessible for study. Reaching this stage he has certainly learned something of the common precautions which have to be observed in the operation of plant, but when that same plant is in the general atmosphere of the "works" it commonly presents a new aspect in which "safety" has to be viewed. Plant and operating personnel are then no longer united for the short duration of mere hours of study. Each individual has his share of responsibility for the safety of all others employed at the works, and safe conditions must pass on from shift to shift, from day to day, with automatic accuracy in attention to detail.

Contributory Negligence

Careful observation, of circumstances which arise and of conditions which exist, will point to some of the common causes of accidents, showing—at the same time—that it is not always the negligent culprit who suffers as the victim of a tool misplaced or of a tool which is no longer fit for use. The newcomer to the works will also observe that each man going about his task exercises due caution, and yet it is still needful for all others to be cautious insofar as their own negligence may be a contributing factor to an accident, as when walking in the path of an overhead runway for a hoist, or when turning a corner where truck or trolley—either hand-pushed or mechanically propelled—may be met.

All the commonly occurring accidents can be avoided, and it is the duty of every employee to play his part in avoiding them. Because the storekeeper issues a defective tool by negligence in inspection, there is still no excuse to be blind to obvious defects and thereby a contributing factor to accident by using the tool; if no other be available, it is possible to use the tool cautiously. Indeed, in avoiding common accidents a great deal can be achieved by observation, and caution dictated by commonsense. Exercise of commonsense to a notable extent permeates the whole subject of safety in industry, with outstanding illustration from the instance of a steam-jacketed pan which exploded after being continuously in use for twenty years, during which time it had been tested but once for its ability to withstand the pressure for which it was made, and that once was when it left the maker's works.

Listen to Advice

Advice given by the works safety officer must be followed, if there is to be freedom from accidents; the seeming trivial things which are pictured in form of safety posters are so presented for the welfare of all concerned, and also for the welfare of "the man who is passing at the time" (he may be the victim of a hammer-head which flies off without warning, just as possibly as the user of a cold chisel with a defective head can receive injury from a splinter of metal). Safety regulations, printed in full and displayed on the works notice board, are there "to be read"; true it is that the law requires some of them to be thus exhibited, but the law would be fulfilled even if these regulations were printed in the smallest of type—which they are not! Moreover, certain safety appliances are provided by the works management (regrettably, sometimes only under force of law) for the avoidance of accidents from recognised causes; therefore make use of them whenever there is advice to do so, or when commonsense indicates their use to avoid a hazard—there are gloves for the hands, gauntlets which protect both hand and arm against corrosive liquids, goggles for the eyes, rubber aprons and rubber boots, and breathing apparatus to give protection against dust and poisonous fumes. Moving parts of machinery have wire-mesh guards for the safety of those who may come too close unawares, likewise certain electrical equipment. Almost everything possible is done to provide safety for the worker, and especially for the careless worker.

The man who takes particular care to acquire safety knowledge becomes an asset to the works, and unconsciously he contributes in a definite degree to the safety and welfare of his fellow-workers. But it is only when all have become safety-minded that complete freedom from accidents (excepting unusual circumstances) can be expected. Consider some of the precautions which have to be adopted in unit process operations which are physical or mechanical. Size reduction by crushing and pulverising demands guards on the machinery, and additionally the use of goggles (for splintery or siliceous material)

and gloves (where material is corrosive); if considerable dust is produced in the operation there is need for masks to avoid breathing troubles, particular stress being laid upon the dangers of silicosis and the effect of dusts which have a lime character. In mixing liquids by mechanical agitation, there can be danger from the splashing of liquid which is corrosive, and vapour or spray of poisonous concentration may be produced in the air immediately above an open mixing tank which is equipped with a fast-running agitator. The last-named hazard is also likely in dissolving and leaching, where mechanical agitation is employed to assist the process.

Hazards to Watch For

The danger from inflammable and toxic solvents must be watched for in extraction processes employing solvents, in solvent recovery, in crystallising, evaporating and distilling, and in the drying of products which have been extracted or crystallised by aid of such solvents. Screening, following the crushing of solid material, has its main hazards in the production of a dusty atmosphere, with breathing troubles and also the risk of a dust explosion (if the dust is carbonaceous or capable of burning). Filtration may involve a corrosive filtrate, with need for protective clothing, gauntlets and boots, when attending to the filter press or other filtering equipment. Pumping operations, and the conveyance of liquids by pipes, has a hazard in the possible development of excess pressure, and unexpected leakage of corrosive liquid; there is also danger in "breaking" joints or opening pipelines with residual pressure or which have not been properly drained. The exact nature of liquids passing through pipes and valves is best indicated by adopting a system of colours for the external protection by paint.

As regards unit process operations which are truly chemical reactions, there is need to guard against excess pressure in autoclaves engaged in amination (the making of amines), sulphonation, oxidation, and like processes; the danger of an explosion, if equipment is not carefully controlled, is present particularly in the case of oxidations and hydrogenations. The making of diazo dyes may give contact with intermediate and final products which irritate the skin; for alkyl and aryl compounds there is possible poisoning by alkyl lead and mercury; in making halogen derivatives it is needful to avoid direct contact with the skin and also avoid fumes evolved in the reaction. Each type of process offers its hazards, which are mitigated by adopting precautions which experience indicates. All this specialised knowledge comes to the new man in the industry as the scope of his employment widens, but at the very outset of his works experience it cannot be stressed too highly that the general safety of plant and equipment depends in no small degree upon keeping the accessory features in good working order. Maintenance, in its strict sense, is the work of the maintenance man, but personnel operating and controlling a process must be quick to detect any sluggish valves, indicators, devices, and mechanism, and equally be on the alert for leakage of liquid, vapour, or fume.

Chemical Workers' Clothing

Special Pool of Coupons

TO meet individual cases of hardship as regards essential industrial clothing among workers in the heaviest industries, a small pool of coupons is available between now and June 19 for any undertaking engaged wholly or partly in mining or quarrying or in the heavy chemical, iron and steel, non-ferrous metals, carbon, coke and by-product, gas production, or shipbuilding industry. The number of coupons in the pool will depend on the nature and size of the undertaking but will not exceed five times, or in the case of a quarry or shipyard four times, the number of its manual workers. The pools are to be at the disposal of representative committees who will draw on them as necessary to assist those among the workers who would otherwise suffer real hardship.

Details of the scheme, which has been drawn up in consultation with the Trade Union Congress and the British Employers' Confederation, are being notified to the Trade Unions and Employers' Organisation in the industries concerned. Application forms ED 283 are available at all local offices of the Ministry of Labour.

TOOL MAKERS' ASSOCIATION

The Gauge and Tool Makers' Association was formed last year to represent the interests of manufacturers of gauges and measuring equipment, jigs and fixtures and special tools, press tools, and moulds and dies. The Association already has a membership of over 50 firms and is working in close touch with the Machine Tool Control and other branches of Government Departments. The President of the Association is Mr. H. H. Harley, C.B.E.; chairman, Mr. F. W. Halliwell, M.I.Mech.E.; vice-chairman, Mr. H. S. Holden. Mr. Gilbert T. Beach was recently appointed secretary of the Association. The Association's offices are at Standbrook House, Old Bond Street, London, W.1 (REGent 0281), and their official booklet details the objects and terms of membership of the Association, together with a list of members.

Industrial Safety Gleanings

Safety Committees : Good Maintenance

WHEN a management is asked whether its works has a safety committee, the reply is often to the effect that there is no committee because the firm experimented with one some time ago, and it was not a success. Why is it that in a few cases these committees seem to fail, while in so many they have been successful? Firstly, because the committee is set up under a total misapprehension of its true function; the management thinks it is setting up a small executive committee to do all the detailed work in connection with accident prevention. This is wrong, for such work is quite beyond the scope of the average joint committee. Secondly, because the management sets up the committee without really having its heart in accident prevention, with the result that the committee's recommendations are not carried out, and even when a suggestion is turned down for a good reason, the reason is not explained to the committee. But even if correctly constituted, the committee may fail if it has not the necessary driving power behind it. A keen chairman is required, for a mere collection of individuals cannot achieve much unless it has a chairman who knows the duties of the committee, and who is prepared to encourage individuals to contribute to the discussions and make suggestions.

Belts and Conveyors

Production can be hindered to a serious degree by the breakdown of a hoist or a conveyor, and may even cause temporary cessation of work, as well as personal injury. Although all hoists are built with load-carrying factors in excess of their rated capacity, like other mechanical equipment they do not take the abuse of overloading without approaching the danger point. Hooks should be drop-forged from steel which will give visible warning of excessive over-loading by slowly opening, and inspection should be sufficiently frequent to detect this. The top hook should be stronger than the bottom hook, but both should have the same danger indicating feature. Hoist chains are preferably electrically welded and made from steel which has exceptionally high tensile strength and elastic limit. Chains which are over-loaded in approach of danger point will stretch "out of pitch" and give indication of this by an irregular fit in the wheel pockets, and both chain and load wheel will suffer destructive wear. For long life, hoist chains must be kept well lubricated.

The idlers on belt conveyors must be kept in good operating condition and must have proper and adequate lubrication. The belt must run true; a belt which " side-sways " is liable to cause excessive wear. "Training" idlers will correct any tendency for a belt to side-sway and will keep it straight in both carrying and returning strands. Excessive wear on the belt, due to the handling of heavy and lumpy material, as well as shock at conveyor loading points, may be greatly reduced by the use of idlers which offer a cushioning effect by their rubber-disc construction. The rubber and duck in conveyor belting are both vital materials which are scarce and it is essential that everything is done to obtain longer belt life.

Power-Driven Tools

Under the Factory Act (Section 14) portable power-driven tools are machinery within the meaning of the section. Recently a firm was fined in a case where an operator was killed by a burst abrasive wheel. A portable abrasive wheel had been borrowed by the operator, on the foreman's instructions, to do a special job. The man had no experience with such tools and, unfortunately, someone had removed the six-inch wheel, for which the tool was suitable, as well as the guard, and substituted an eight-inch wheel. Probably owing to a higher rate of revolution than usual, the wheel burst. There was no guard and the fragments flew out in all directions, some of them striking the operator with fatal results. The prosecution was taken under the Section for failure to provide secure fencing.

Conductivity Alarm

An important war plant in the U.S.A. having a number of acid coolers was faced with the problem of detecting possible leaks in these coolers, despite shortage of labour. According to Industrial Instruments, Inc., Jersey City, N.J., the problem was solved by the use of conductivity controllers of the type known as the Solu-bridge. During normal operation of the acid coolers the Solu-bridges remain inoperative. However, should acid enter the cooling water system from any source whatever, the conductivity of the water will increase and the instrument will sound a warning, light a danger light, and open a valve in the water recirculating system diverting the acid water to waste. When contamination ceases the instrument automatically restores the circulating system to normal.

The Japanese have decided to increase the production of castor oil beans in Malaya and Sumatra in order to be able to produce a high grade oil for aeroplanes.

The Trend of War-Time Earnings

Analysis of Accounts of Chemical Companies

by S. HOWARD WITHEY, F.C.I.

DURING the past three years, the majority of chemical manufacturing, equipment and allied companies have been affected by the various rationing schemes and priority regulatons, and when these handicaps are taken into account, the financial results can be regarded as satisfactory. The future of certain sections depends largely upon co-operation, and unless the shipping position improves, and a greater quantity of raw materials becomes available for distribution, prospects for the immediate future may not be so encouraging. Strong financial position and efficient organisation, however, will enable most firms to adapt themselves to any changes which are likely to occur.

In the case of the British Aluminium Company, Ltd., a further increase in trading profit was recorded during 1942, the actual figure being £1,051,119. This compares with £973,582 in 1941, and £912,211 in 1940. After charging income tax, the cost of debenture service, and depreciation, the balance of net profit for 1942 works out at £569,869, the corresponding amounts for the two preceding years being £517,332 and £508,156. The dividend on the company's £1,500,000 6 per cent. preference shares takes £90,000, while the ordinary dividend of 10 per cent. absorbs £300,000, so that after placing £150,000 to reserve, compared with £100,000 previously, there remains a credit balance of £251,997 to be carried forward to the next account, as against £222,128 brought in. The final figures for the past year are summarised below :—

	£	£
Brought forward from 1941 ...		222,128
Net profit—1942		569,869
Disposable balance		£791,997
6 per cent. dividend on £1,500,000 preference shares, gross		90,000
10 per cent. dividend on £3,000,000 ordinary shares, gross		300,000
Transferred to reserve		150,000
Carried forward to 1943		251,997
		£791,997

In addition to the general reserve of £3,200,000, of which £500,000 is earmarked for assets in France and Norway, there is a depreciation reserve of £1,600,000, while plant and property additions during 1942 cost £52,104, making a total of £4,710,362. Investments in subsidiary companies, including advances, etc., now aggregate £7,858,071, as compared with £7,834,265 at the end of 1941, and the floating assets are £992,016 higher at £4,517,405, comprising stocks and stores, debtors, investments, and cash and tax certificates. The company's securities are very well established, and at recent prices the yield is about 4 per cent.

Although rationing for non-essential purposes curtailed some outlets, Borax Consolidated, Ltd., have been compensated in part by new essential uses, and in 1942 the trading profit increased to the new high record of £659,586. This figure compares with £636,900 for 1941 and £543,817 for 1940, but after debiting depreciation, debenture service, administration expenses, and £245,000 for taxation, the balance of net profit works out at £122,658, representing a decline of £16,513 in relation to the 1941 figure, but an increase of £7272 over that for 1940. Dividends on the preference and preferred capital take £40,000 net, and the rate of dividend on the deferred ordinary capital has been maintained at 7½ per cent., absorbing £48,750 net, so that after allocating the sum of £30,000 to the war contingency reserve, the carry-forward is £3908 higher at £260,999 :—

	£	£
Brought forward from 1941 ...		257,091
Net profit—1942		122,658
Disposable balance		£379,749
5½ per cent. dividend on preference capital ...	£800,000 £44,000	
Less tax at 10s. in the £	22,000	22,000
6 per cent. dividend on preferred ordinary capital	£600,000 £36,000	
Less tax at 10s. in the £	18,000	18,000
7½ per cent. dividend on deferred ordinary capital	£1,300,000 £97,500	
Less tax at 10s. in the £	48,750	48,750
Allocated to war contingency res.		30,000
Carried forward to 1943		260,999
		£379,749

At the recent price of 34s., the deferred ordinary £1 units give a return of 4.4 per cent.

Sales of china clay have been restricted, and several pits owned by English Clays Lovering Pochin & Co., Ltd., have ceased production, but the financial results of the

past year's operations show a decided improvement. The trading profit made by this company amounted to £261,082, which figure is arrived at after adding investment income and making provision for E.P.T., N.D.C., and deferred repairs. Income tax takes £116,923 but, after debiting war damage contributions, interest and depreciation, the balance of net profit is £59,799. This compares with £35,176 in 1941, and with £67,258 in 1940, and allows for a charge of £15,000 for leasehold and mortgage debenture reserve, and after placing £10,000 to reserve the carry-forward is slightly smaller at £43,032. The balance sheet discloses reserves totalling £322,915 and fixed assets for £2,834,312, while the current assets aggregate £626,185 as compared with £456,635 at September, 1941. The company's profit appropriation account is summarised below :—

		£
Brought forward from 1941	...	43,070
Net profit—1942	...	59,799
Disposable balance		£102,869
5½ per cent. dividend on 1st preference shares	£531,111 £29,210	
Less tax at 10s. in the £	14,605	14,605
7 per cent. dividend on 2nd preference shares	£374,651 £26,226	
Less tax at 10s. in the £	13,113	13,113
2 per cent. dividend on Ordinary shares	£2,211,930 £44,238	
Less tax at 10s. in the £	22,119	22,119
Transferred to reserve ...	...	10,000
Carried forward to 1943 ...	...	43,032
		£102,869

The first preference shares were recently quoted at 17s. 6d.

Pioneer work with moulding powder on the part of British Industrial Plastics, Ltd., has been rewarded by the satisfactory results obtained, the company's trading profit during the past year reaching the high record of £295,799. This figure compares with £169,123 for 1941, and £163,069 for 1940, and the rate of dividend on the ordinary capital has been raised from 6 per cent. to 8 per cent., which restores to the level of 1940. The assets of the parent company and its subsidiaries—Colfast Buttons, Beetle Products Co., Plastic Moulds and Services, and the Streetly Manufacturing Co., are shown on the consolidated balance sheet at £841,679, representing an increase of £155,104, and over the whole group the sum of £36,941 was set aside for depreciation of plant and buildings. The final figures covering the financial year ended

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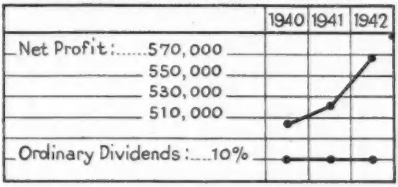

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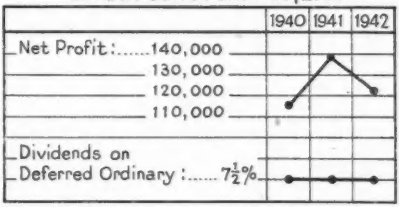
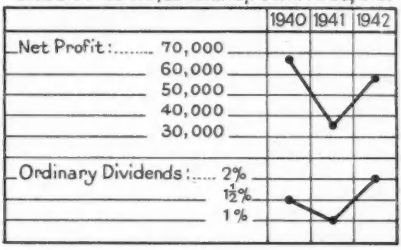
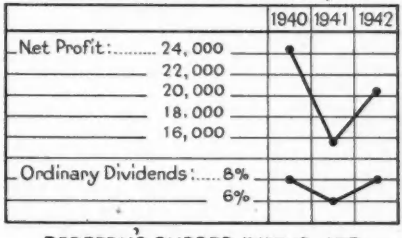


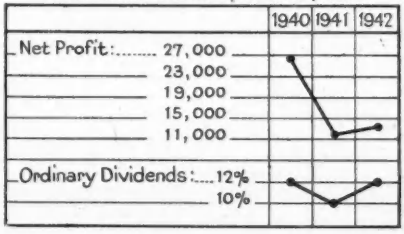
ENGLISH CLAYS, LOVERING, POCHIN & CO, LTD.



BRITISH INDUSTRIAL PLASTICS, LTD.



REDFERNS RUBBER WORKS, LTD.



September last were balanced in the manner indicated below:—

	£
Brought forward from 1941 ...	6288
Net profit—1942	20,052
Disposable balance	£26,340
10 per cent. dividend on £14,820 preference shares, tax free ...	1482
8 per cent. dividend on £428,991 ordinary shares £34,320	
Less tax at 10s. in the £ 17,160	17,160
Transferred to reserve	1000
Carried forward to 1943	6698
	£26,340

At the recent price of 5s. 3d., the ordinary 2s. shares yield 3 per cent.

Technique developed in dealing with compounds has been revived to maintain output, and the feature of the report of Redfern's Rubber Works, Ltd., was the reversion to the ordinary dividend of 12 per cent. Including investment income, the trading profit amounted to £66,671 during the past year, compared with £47,249 in 1941 and £43,017 in 1940. The net profit of £12,830 was more than the amount realised in 1941, but less than the 1940 figure, after allocating to pensions, and after distributing the dividends the carry-forward was £1130 higher, thus:—

	£
Brought forward from 1941 ...	10,043
Net profit—1942	12,830
	£22,873
7½ per cent. dividend on £80,000 "A" preference shares £6000	
Less tax at 10s. in the £ 3000	3000
7½ per cent. dividend on £40,000 "B" preference shares £3000	
Less tax at 10s. in the £ 1500	1500
12 per cent. dividend on £120,000 ordinary shares £14,400	
Less tax at 10s. in the £ 7200	7200
Carried forward to 1943	11,173
	£22,873

Fixed assets stand on the balance sheet at £167,722, and current assets at £209,741, the liquid surplus over current liabilities being £100,202. At the recent price of 9s., the ordinary 5s. shares give a return of 6.6 per cent.

(To be continued)

STATISTICAL VALUATIONS OF SHARES

To enable ordinary shareholders of chemical manufacturing and associated companies to assess the intrinsic values of their holdings apart from extraneous influences, we will reserve space for inquiries from subscribers, whose queries will be answered by Mr. S. Howard Withey, under initials or a pseudonym. When accounts or documents are sent for his perusal, they should be copies only, as they cannot be returned, and no responsibility can be accepted in connection with this service. No valuation can be placed on preference shares, and no advice given regarding the acquisition or disposal of any stocks or shares. Holders of equities wishing to compare the market values of their holdings with the statistical values based on disposable balances should address their inquiries to the Editor.

Non-Metallic Minerals

U.S. Production

THE United States produced more metals and minerals in 1942 than at any time in its history, according to a report of the U.S. Bureau of Mines. There was a big increase in demand for moulding sand, and for limestone used as flux in blast furnaces. An advance of about 11 per cent. in sales of clay was due largely to the great increase in fireclay sales to the refractory industries. A 10 per cent. increase in salt production was brought about by larger demands for chemical uses, notably in the manufacture of metallic magnesium. An extension in the fertiliser industry led to an increase of about 6 per cent. in the sales of phosphate rock.

High records of production were registered in 1942 for several important non-metallic mineral commodities. The cement output exceeded in quantity the previous record of 1926. Other widely used commodities that reached sales records were sand, gravel, stone, crude barite, phosphate rock, and high-grade clays. Because of the exceptionally high demands of steel furnaces, fireclay and fluorspar sales far outstripped all previous records. Sales of potash salts for the first time exceeded domestic demands in 1942. Increases in sales of many non-metallic minerals are to be attributed to the striking trend at this time to substitute non-metallic products for metals. Outstanding examples of this are glass containers to take the place of tin cans, lightweight concrete to reduce the need of structural steel, and gypsum lath to take the place of metal lath.

Discovery and exploration of millions of tons of strategic, critical and essential domestic minerals, the development of metallurgical processes to speed the mine-to-metal cycle, a threefold increase in helium production, and wider utilisation of American coals for producing heat, power, and chemicals, were outstanding features.

Safety in Welding and Cutting Containers*

How Dangers Can be Eliminated

OXY-ACETYLENE welding and cutting blowpipes are two of industry's most useful and indispensable tools, and it is not enough to know the proper procedures for producing excellent welds and cuts. It is equally important to know how to use these tools safely. Safe practices are particularly important in the repair of containers, which are frequently used for inflammable materials. Containers that have previously held inflammable substances require special caution. Unless it is known beyond doubt that the former contents could not possibly form an explosive mixture with air, or prove explosive or hazardous in any other way, the only safe course to follow is to treat the container as if it does hold an explosive mixture, and to take proper steps to make the tank or drum safe to work on.

Explosive mixtures may occur in a container in a number of ways. They can easily form when the container has held an inflammable fluid such as petrol, which gives off vapour that is explosive when mixed with air or oxygen in certain proportions. Vapours from some other inflammable liquids have an even greater explosive range when mixed with air. Grain alcohol vapour is explosive in air when present in amounts from 2.8 per cent. to 19 per cent.; wood alcohol vapour, from 5½ to 36½ per cent.; and ether vapour, from 1 to 48 per cent. Hydrogen, a gas which sometimes forms in acid drums, is explosive in air when present in amounts from 4 to 80 per cent. Care must be taken to remove all traces of acid, because a weak acid solution often reacts with metal to produce hydrogen where a strong concentrated acid will not. Liquids and solids, such as kerosene, oil, and grease, will under certain conditions also give off vapours capable of forming explosive mixtures with air. Usually, the application of heat will cause vapour to form. This can easily happen if welding or cutting is done on a container not thoroughly cleaned of oil, grease, and similar materials.

Precautions in Cleaning

Cleaning is best done in the open where the inflammable vapours will escape and quickly blow away, but if the cleaning must be done inside a building, make proper arrangements for forced ventilation so that the vapours will not accumulate and create a hazard. Before starting work make sure that anything that might ignite the gas is kept well away from the container, such as open flames, electric light or power switches, and electric lights. Use only flashlights or electric lights that are approved for use near inflammable gases, and avoid using tools that might make sparks. Drain or empty out as much of the material remaining inside the container as possible and dispose of any materials cleaned out so as not to have hazardous substances near the work. Sludge and sediment can sometimes be removed by scraping; hammering with a wooden mallet may help to loosen scale, but never use chisels, scrapers, or hammers likely to cause sparks. When containers are divided into compartments, treat each compartment the same irrespective of which one is to be worked on. If a container has previously held a substance that can be dissolved in water, hazards can be eliminated quite simply. Acids and alcohols, for instance, are usually soluble in water. To clean such a container, flush it thoroughly with water several times. Finish by completely filling the container with water and then, to make certain that little or no gas remains, or that some gas will not form because of incomplete cleaning, test the air inside.

Cleaning Methods

Containers that have held materials that are not soluble in water or that cannot be identified, can be cleaned and made safe by one of several methods. Containers that have held materials that vaporise readily are often cleaned by the live-steam method; they can also be cleaned by the hot chemical solution method. Oil and grease are more readily removed by the hot chemical solution method. The lighter oils are sometimes cleaned out with live steam, followed by a hot chemical solution rinse. Certain chemical compounds such as sodium silicate or tri-sodium phosphate, when dissolved in water, will "cut" oil, grease, and similar products. When the solution is flushed or drained away, some or all of the oil or grease goes with it, according to the strength of the chemicals in the solution and the amount of oil or grease present. The steaming method is suitable for removing gases and liquids that are readily volatile. Live steam is circulated through the container until it is thoroughly heated. When this stage is reached steam vapours will flow freely out of the vent and will carry any volatile substances that have remained in the container.

Even though the container has been

* From an article in *Oxy-Acetylene Tips*, January, 1943, p. 35.

washed out, steamed, or treated with hot chemical solutions, it is best to take certain additional precautions. This is especially advisable if there are joints or seams that might release explosive vapours when they become heated during welding or cutting. The reason for this is that thorough washing, steam, or chemical treatment will not always completely remove materials that may have seeped into crevices where one metal surface is pressed against another. Accumulation of any large volume of explosive gas from seams is obviated by filling the container as full as possible with water without interfering with the welding or cutting. The air remaining above the water is then partly or entirely replaced by an inert gas such as carbon dioxide or nitrogen. This will help to prevent the ignition of explosive gases that might be driven out of seams and joints by the heat of welding or cutting. The more the water that can be put into the container, the less the carbon dioxide or nitrogen that will be needed.

The use of inert gas is not suitable for containers that have held cellulose nitrate or its mixtures, aluminium or magnesium powders, carbon bisulphide, or other materials that may decompose and release combustion-supporting materials and thus make the inert gas useless. Carbon dioxide is widely available and is the inert gas most often used. The procedures to follow will therefore be based on carbon dioxide. If nitrogen is used, the volume must be at least 10 per cent. more than the volume specified for carbon dioxide.

Final Safety Steps

The final steps to take before doing any welding or cutting are as follows: (1) if it is possible to move the container, place it in such a position, by tilting and blocking, that the spot to be worked on is at or near the top; (2) fill as full as possible with water without interfering with the work to be done; (3) put a sufficient quantity of carbon dioxide into the container so that at least 50 per cent. of the air in the space above the water will be displaced. Hydrogen or carbon monoxide requires a minimum concentration of 80 per cent. carbon dioxide to make a mixture with air non-inflammable and non-explosive. If you suspect that these gases are present, play safe and increase the carbon dioxide content to 80 per cent. or more. Always keep the face and arms as far away as possible from the head of the container when doing any welding or cutting. The air or air-gas mixture inside any container can be most easily tested for an inflammable or explosive mixture by using a suitable gas detector. If a detector is not available, a gas sampler can be used.

A CHEMIST'S BOOKSHELF

Modern Industrial Lighting. By G. Bernard Hughes. London: Hutchinson. Pp. 128. 15s.

In every industry and in all industrial premises illumination is of the utmost importance if output is the first essential, and in this book, the author, who is a proved technical expert on the subject, writes with understanding of the factory owner's problems and of the up-to-date practical means of meeting them. The requirements of the new Factory Lighting Regulations have been introduced to make factory owners and works managers consider their lighting arrangements in relation to most recent discoveries, and the author has co-ordinated facts to show all concerned how they can benefit economically by research and also conform to statutory requirements. Mr. Hughes has made a representative survey of some 120 industries and explains briefly where and in what manner operations need light; he gives a recommended value of foot-candles and, in an appendix details recommended foot-candle intensities for industrial interiors, including chemical works.

Synthetic Resins and Allied Plastics. By various authors. Edited by R. S. Morrell. Second Edition. Pp. 580. Oxford University Press. London: Humphrey Milford. 1943. 35s.

The great technical advances made in both the production and application of synthetic plastic substances during the past four years makes the new edition of this established text-book very welcome. Plastics are invading a great many important industries, and to the fields into which these products have entered there is added a wide range of special war-time utilities. This comprehensive book contains contributions by ten different authors, and gives authoritative representation of the chief sections of the synthetic resins and allied plastics. It begins with a historical review of the development of synthetic resins, while a general introduction gives a summary of chemical and physical properties of the most important classes, in which the reader obtains a general survey of the subject and finds the bibliography and all essential technological data. Subsequent chapters deal with the various plastics, resins and methods, and finally with the problems of resinification. There are 59 illustrations, numerous tables and formulæ, and a subject and author index, from which information is easily found. An omission, however, is discs for the manufacture of buttons, so-called "Blanks," an additional form of casein plastics besides rods and sheets. These "Blanks" save labour and casein, and are used on a vast scale. On page 406, "dorcaline" should read dorcasine.

American Patents

Miscellaneous and Metal Applications

TWO New York chemists, H. S. Polin and A. I. Nerken, propose the use of formamide as a superior anti-freeze substance to any used till now. When mixed with water, a small amount of formaldehyde is added to prevent deterioration (U.S.P. No. 2,308,246).

A process for making a good drying oil, suitable for use in painting, out of non-drying castor oil has been patented (U.S.P. No. 2,309,273). The castor oil is converted into a clear, light-yellow oil having excellent drying qualities, similar to those of tung oil, by heating under vacuum for about four hours at from 180° to 240°C. in the presence of a catalyst of the persulphate of one of the alkali metals.

Chlorine can be made as a by-product of the potash industry through a process patented by Donald L. Reed (U.S.P. No. 2,309,919). When potassium chloride is treated with nitric acid to make potassium nitrate, one of the by-products is nitrosyl chloride. Also given off are hydrogen chloride, nitrogen peroxide, and water vapour. This mixture has been proposed as a source of chlorine, but previous processes have involved the use of too much energy. Mr. Reed avoids the difficuly by the use of a catalyst. Finely-divided silica, in one of several known forms, is activated by heating to 400°C. or above. After it has cooled, the gas mixture is passed through it at a relatively low temperature (about 40°C.). Silica has a selective hold on various substances; most on water, least on chlorine, so that the chlorine comes off first, in a pure state. When, later, it becomes mixed with some other gases, the process is stopped, the silica heated again, and the process starts once more.

A quick yet sensitive method for measuring the porosity of paper, fabric, and similar sheet materials has been assigned to the G.E.C. by B. W. Nordlander (U.S.P. No. 2,310,111). First a sheet of paper covered with a film of yellow selenium sulphide is laid down. Over this is placed a sheet of the material to be measured. On this in turn is placed an inverted funnel, under which is suspended a small amount of mercury, with electrical or other means of vaporising it. The mercury vapour, penetrating the pores, turns the sulphide black; and the black-on-yellow pattern on the lower sheet gives a measure of the test sample's porosity.

Metallurgical Patents

Metal and alloy patents recently issued by the U.S. Government include a patent (No. 2,287,082) to the Chemical Marketing Co., Inc., for the production of iron powder of great reactivity. This process comprises electrolysing a ferrous chloride solution containing ammonium chloride at a current density of 6-7 amperes per dm. in the presence of formic acid in such a quantity that the *p*H value of the solution lies between 6.5 and 7.2. Among magnesium products a manganese alloy has been patented by the Chicago Development Company (No. 2,286,199), while a process for the production of metallic magnesium has been patented by the Dow Chemical Co. (No. 2,286,209). Magnesium base alloy containing from about 0.1 to 0.7 per cent. of cerium, 0.05 to 0.5 per cent. of calcium, 3 to 7 per cent. of cadmium, and about 1.5 to 2.5 per cent. of manganese, and the balance of magnesium is another of the Dow Chemical Co. new patents, while a patent surface treatment of magnesium and magnesium alloys is assigned to the Aluminum Company of America.

PLASTICS GROUP

The officers of the Plastics Group of the Society of Chemical Industry for 1943-44 have all been re-appointed. Of the committee, the following retire under Rule 7: L. W. Blundell, J. O. Cutter, D. N. Davies, H. Langwell, and G. S. Whitby. Dr. Whitby, as an immediate past chairman, is eligible for re-election. The committee will appoint two members to fill two of the vacancies; the two remaining vacancies will be filled by election at the annual general meeting. Nominations for the two vacancies, signed by two members, and with the written consent of the nominee, should reach the Hon. Sec. (28 Cardinal's Walk, Hampton, Middlesex) by April 24.

INFRA-RED RADIATION

A bulletin on "Industrial Paint Baking in Infra-Red Radiation" has been issued by the BRITISH THOMSON-HOUSTON CO., LTD., Rugby. It is based largely on a paper presented by Mr. R. Maxted to the Illuminating Engineering Society on December 9, 1941. Illustrated by diagrams and photographs—including some striking pictures of an infra-red tunnel—the bulletin deals with many applications of infra-red energy, the characteristics of materials, the determination of flux densities, reflector and installation design, etc. The booklet is well printed and pleasingly produced; the company proposes to follow it up with others on similar lines.

War Damage Payments

Alterations in Amending Act

PAYMENT for war damage under the War Damage Acts, 1941 and 1942, may take the form of a " cost of works " payment (where premises are considered repairable) or a " value " payment (where it is not considered expedient to repair). Where the premises are a total loss, the determination is ordinarily for a " value " payment, and where the damage is not considerable, a " cost of works." But there are many other cases in which the War Damage Commission is required to take into consideration whether a " cost of works " payment to make the premises as before is likely to be more than would be the " value " payment, which would be the difference between the value of the premises before the damage and after the damage. The figures for value payments are ascertained by references to prices current at March 31, 1939. It will be understood that in considering these matters, the Commission has been obliged, in estimating what the cost of making good would be, to take what the building costs, etc., would likely to be at some national date (prices current at some future date when the works are executed) in the future, and with costs much more than pre-war this has really weighed against the application of the " cost of works " provision to many premises.

A new (1943) Order now makes important alterations, so that, instead of basing figures for repair on probable costs in the future, the cost of making good at March 31, 1939 (prices of materials and rates of remuneration and building costs generally), can be taken when considering a determination, as well as when reckoning " value " payments. The actual payment will, however, be based on the price of materials, labour, etc., current when the works are executed.

Arising from this, there are likely to be more " cost of works " payments, and these are made forthwith, whereas ordinarily " value " payments are left until after the war (plus 2½ per cent. interest from date of damage). It should be noted that where a person requires cash to rent or buy premises for business or dwelling purposes, current advances are obtainable up to a sum of £800 (£1600 if required for both purposes), and also currently sums can now be obtained where necessary expenditure has been incurred for such things as demolition to protect surviving parts of the property, or for recovery of materials, or for construction of a new building to be used in substitution for the damaged building, and so forth. The alterations by this new Act apply whether the war damage occurred before or after the passing of the Act on March 25, 1943, and, where a determination has already been made, the Commission has power to alter the determination after consultation with the interested persons.

Grass Drying

Suggestions at S.C.I. Meeting

A MEETING of the Agriculture Group of the Society of Chemical Industry was held in the London School of Hygiene recently, when Mr. W. H. Cashmore (National Institution of Agricultural Engineering) gave a paper on " Design of Drying Machines for Agricultural Products." Dr. L. H. Lampitt, F.I.C., who presided, said that invitations had been issued to two other groups of the Society of Chemical Industry, the Food Group and the Chemical Engineering Group, and also to the members of the Institute of Mechanical Engineers. It was somewhat significant that in these days it had become necessary, that it had been thought desirable, and that it was obviously expedient to gather together at one meeting so many types of scientists and engineers. It was symptomatic, he might say, of the times when one side of science was absolutely useless, unless in collaboration with other branches and other sides of science. Dr. Lampitt added: " In the groups of the Society of Chemical Industry we have found, and the agriculture group is finding, that the strength of science lies entirely in the proper collaboration between its different branches." Concluding, he remarked that he was sure that Mr. Cashmore would find it difficult to cover the whole ground of drying, but with our own Government, and also the United States, so keen on dehydration, and with the commissions which were going from this country to the States, Africa and the Far East, all considering dehydration, the paper seemed to be most apposite.

Chemical Treatment

Mr. Cashmore covered the different forms of grass and grain drying from the agricultural side and said that he felt there was rather a strong case for a small grain dryer. In the discussion following, Mr. Brian Reavell said he wondered whether it was the right approach to go for the cheapest dryer or stress cheapness at the expense of efficiency and value of the product produced. Was it not better to pay a little more and so get a quality material with a high protein content? The case was not entirely in the hands of the chemical engineer, but very much in the hands of the machinery designer and the farmer. He suggested that there might be scope for investigations for retaining grass before drying so that the plant could be allowed to work over a longer period. The thing he had in mind was some chemical treatment of grass. In looking for the ideal grass dryer, he thought, the plant should be made on simple lines and that designers should not be misled by the search for high thermal efficiency. The possibility of infra-red grain drying in this country was extremely remote, he thought, on account of the high capital cost.

Personal Notes

MR. G. PARSLOE has been appointed secretary of the Institute of Welding.

MR. A. E. WILLIAMS has been elected an additional director of the Commercial Gas Company. Mr. Williams retains the office of chief engineer of the ocmpany.

SIR HENRY DALE, P.R.S., has been awarded the Harben Gold Medal by the Royal Institute of Public Health and Hygiene.

DR. H. A. WHITE, consulting metallurgist of the Union Corporation group of South Africa, has been made an honorary member of the Society of Chemical Industry, in commemoration of 40 years' research on problems in association with the extraction of gold from its ores.

MR. A. PARKER, D.Sc., F.I.C., since the outbreak of war acting director of water-pollution research in the D.S.I.R., and previously senior research chemist to the joint committee of the University of Leeds and the Institution of Gas Engineers, has now been appointed Director of Fuel Research in the department. Mr. Parker has for many years served on the council of the Institution of Chemical Engineers. MR. E. BARNARD is to be principal assistant secretary, and MR. R. O'F. OAKLEY and MR. G. R. D. HOGG assistant secretaries.

Obituary

MR. ALFRED CORNELIUS ROUSE, O.B.E., director of English China Clays, Ltd., and of English Clays Lovering Pochin, Ltd., died at Mevagissey, Cornwall, on April 7, aged 56.

MR. AMOS ENGLAND, M.Sc., chief chemist and consultant to Blythe Colour Works, Ltd., died at West Hagley, Stourbridge, on April 4. He specialised in the chemistry of ceramics and colours and his work was well known both on the Continent and in America, notably in Canada.

MR. JOSEPH HENRY LESTER, F.I.C., who died suddenly at Monton, near Manchester, on April 2, aged 74, was one of the leading textile technologists in the country. A native of Penrith, he was educated at Ackworth School and Manchester University, and joined the Tootal Broadhurst Lee Company in 1911. He had served on the council of the Institute of Chemistry, and was regarded as the founder of the Textile Institute, of which he was a vice-president and a medallist. He was also a member of the council of the British Cotton Industry research Association. Although he retired from active participation in industrial affairs in 1937, he continued his researches in the textile and other branches of science up to the end.

MR. ARTHUR OWEN BENTLEY, whose death at the early age of 45 is announced from Nottingham, was Reader in Pharmaceutics and Head of the School of Pharmacy in the University College there. He was well

Mr. A. O. Bentley.

known to readers of THE CHEMICAL AGE for the articles on Synthetic Drugs and Pharmaceuticals which he used to contribute at regular intervals, in collaboration with Dr. H. S. Cox, although pressure of work had latterly forced him to discontinue his contributions. His energy and skill in both teaching and organisation will be greatly missed in Nottingham, and chemists will not quickly forget his gift of lucid exposition of technical progress in the science that he served so well.

New Control Orders

Soya Beans

The Minister of Food has made an Order controlling soya beans, and prohibiting their use except for human food or in the manufacture of human food. It also stipulates that any person wishing to buy or sell soya beans, otherwise than by retail, must first obtain a licence from the Ministry of Food. The Order came into force on April 11, and will be known as the Soya Beans (Control) Order, 1943 (S. R. & O. 1943, No. 517).

Export Control

Under the Export of Goods (Control) (No. 4) Order (S. R. & O. 1943, No. 455), which comes into force on April 19, licences will in future be required to export: talc, steatite, soapstone, and mixtures consisting wholly or mainly thereof; butane and mixtures containing butane; and quillaia.

General News—From Week to Week

The paper on "The Problem of Unemployment," published privately in January by Lever Brothers and Unilever, Limited, has been issued as a pamphlet by Harrap and Co., price 9d.

The changes in the Purchase Tax announced by the Chancellor of the Exchequer in his Budget Speech are explained in detail in Customs and Excise Notice No. 81A, a leaflet of which copies have been posted to all traders registered under the Purchase Tax.

Dermatitis is the subject of two leaflets just published by the Ministry of Labour: Memorandum on Dermatitis from Glues Used in Aircraft Construction (Factory Form No. 331, price 1d.), and Cautionary Notice on Dermatitis from Synthetic Glues (No. 336, price 2d.).

The paint industry has created a liaison committee, which will cover a wide field of paint problems, and act between the National Federation of Associated Paint, Colour and Varnish Manufacturers, the National Federation of Master Painters and Decorators, and the Federation of Painting Contractors.

The Vulcanised Fibre and Leatheroid Association has been registered as a company limited by guarantee without share capital, to assist the Ministry of Supply in the allocation and distribution of vulcanised fibre and leatheroid, etc. The registered office is at Abbey House, Baker Street, N.W.1.

Wholesale prices in March again showed little change, the index figures for coal, iron and steel, and non-ferrous metals remaining constant. The figure for chemicals and oils rose from 142.7 to 142.8 (1930 = 100), the rise being accounted for by the seasonal change in the prices of sulphate of ammonia and superphosphate of 1s. 6d. per ton.

Large factories whose towel ration for 1943 works out at 100 coupons or more are being given part of this in the form of coupon-equivalent certificates marked "Series Two." These do not become valid until July 1, 1943, and under a General Licence (S.R. and O. 1943, No. 154) may, if properly endorsed, be used for the purchase of towels on and after that date.

Eight thousand gallons of formalin were produced last year at the plant of Irish Alcohol Factories, Ltd., Cooley, Louth, and the company is now considering undertaking the manufacture of ether. The process for formalin manufacture was evolved in the laboratories of Trinity College, Dublin, by the Eire Emergency Scientific Research Bureau last year, and later transferred to commercial operation by the Alcohhol Factories.

Prices to be paid by the Minister of Supply in respect of the shares of the Itabira Iron Ore Co. have been announced by the Treasury as follows: Holders of 7 per cent. cumulative first preference shares to receive 15s. per share; 7 per cent. non-cumulative second preference shares, 2s. 6d. per share; and ordinary shares, 3d. per share.

When a 90-foot chimney-stack crashed through the roof of the dyeing room and proofing department of the Manchester Proofing Co.'s Middleton works last week, two workmen were killed and others injured. Although broken steam-pipes caused considerable damage and confusion, men from an adjoining dyeworks went immediately to help, and danger from scalding was soon averted.

At a luncheon recently given in Birmingham by the directors of the London Aluminium Company to Sir W. Murray Morrison, vice-chairman and managing director of the British Aluminium Company, and presided over by Mr. Arthur H. Johnson, Sir Murray gave an interesting description of the history of the aluminium industry in this country since his pioneering days, when aluminium was more or less a scientific curiosity, and even regarded as a precious metal.

Over 500 new names are added to the black list in the Trading with the Enemy (Specified Persons) (Amendment) (No. 5) Order 1943, which came into force on April 6. They include: Establecimiento Metalurgico Kurt Richter, Dorrego 1951, Rosario, Argentina; Laboratorios "Riosol," Jesus, 20 de Julio, Cuartel, Barranquilla, Colombia; and Tubos Metalicos Vincke, Mallorca 15, Palamós, Gerona, Spain. Deletions from the list, which number 110, include Productos Chimicos Elekeiroz S.A., S. Paulo, Brazil.

Foreign News

To assist in the exploitation of the Borate de Guillagua y Puntanegra Mines and for a central installation of calcium borate mines in Chile, the Corporación de Fomento is reported to have set aside 1½ million pesos, owing to the present heavy demand for the product. Preliminary work done at the mines has revealed that they contain about 50,000 tons of borax.

The U.S. produced more metals and minerals in 1942 than at any time in history, according to the Bureau of Mines. The value of all mineral products produced in 1942 reached a record figure of over $7,500,000,000, exceeding by 8 per cent. the peak year of 1920, when prices were abnormally high, and beating the 1941 level by 10 per cent. All branches of mineral production shared in this achievement.

Twenty large distilleries, equipped with machinery made locally, are to be installed in Brazil for the extraction of alcohol from mandioca root. Eight of these are to be set up in the State of S. Paulo.

It is reported that twelve new synthetic rubber and petrol works have been opened by the Germans. The work was carried out by the Todt Organisation and the workers have been brought from the Donetz.

The Italian Ministry of Agriculture has ordered the cultivation and extension of bay-trees (*Laurus nobilis*) for the production of berries, which give 30 per cent. of fatty aromatic oil, to make up for the absence of coconut oil.

A new concern, called the Companhia Cimento Portland Paraná; with a capital of 30 million cruzeiros, is being formed to erect a cement manufacturing plant at Curityba, State of Paraná, Brazil, designed for an initial daily output of 100 tons.

Developments in the chemical-manufacturing industry in Peru in 1942 included production of arsenic trioxide, or white arsenic, and copper sulphate. Plans are under way for making chlorine, calcium hypochlorite, and caustic soda.

The U.S. authorities are prepared to purchase Brazilian tung oil, which is likely to become an important product in the State of S. Paulo. The output during the next crop year will probably be in the neighbourhood of 5000 tons of nuts, from which about 700 tons of oil should be extracted.

The Government of Palestine has strictly forbidden the sale of reeds from Lake Huleh, North Palestine, to other than military suppliers, since it has been discovered that they can be used in insulating board for tank interiors. Experiments have shown that they are far better than cork.

When a survey of the bauxite deposit in the Moçambique Territory was carried out at the beginning of last year it was found that the total tonnage of the deposit was about 2.4 million tons, only 68,000 tons of which were available for immediate consideration. Of this total 2000 tons showed sufficiently low silica content to be considered as a base for aluminium manufacture without further treatment.

A Non-Ferrous Metal Smelters' Association of South Africa has been formed with its head office in Johannesburg. The new body comprises leading Union smelters and alloy manufacturers, and its object is to raise the standard of smelting of non-ferrous materials in the Union, to voice the views of all smelters, and generally to represent the interests of smelters. The association is fully recognised by the Controller of Non-Ferrous Materials and will, at his request, shortly bring a pool-buying system for raw materials into operation on behalf of its members.

The extraction of oil containing vitamin A from bonito-fish livers in the Vigo district of Spain is a new development. A leading firm processed some 50 tons of bonito livers in 1942, yielding about 2000 litres of oil. Output in 1943, according to estimates, should be roughly the same as that of 1942.

Import of asphalt into Canada is now prohibited by the Revenue Department, except under permit from the Oil Controller. The order also covers asphaltum oil for paving or other purposes; asphalt preparations in liquid form containing asbestos or other fibrous materials; asphalt caulking compounds, cement, and emulsions; asphalt shingles, building boards, etc.

Sewage and sewage sludge have been shown, according to recent reports from the U.S., to contain hormones which stimulate plant growth, such as indole, skatole, indole-acetic acid and naphthalene-acetic acid. These hormones have not been extracted or identified clearly, and their value is still questionable, but some of the stimulating effect of sewage and sludge on plant growth is ascribed to them.

Several hundred tons of guayule rubber are now being extracted for war purposes by the U.S. Forest Service. The rubber is processed chiefly from an old guayule plantation purchased by the government in Salinas Valley, California. About 550 acres are being harvested and they are expected to yield about 4000 tons of shrub. On the basis of small samples, the total yield this year is expected to be about 600 tons of rubber.

The United States' de-tinning programme, originally conceived on a somewhat grandiose scale, has had to be drastically curtailed owing to the inadequate receipts of old tin cans. Plans called for the erection of de-tinning plant in various districts to deal with a total of 280,000 tons of shredded cans per annum, as well as 13 shredding and cleaning plants. This is now reduced to three small shredding plants (10,000 tons each) without de-tinning facilities, and one or possibly two shredding and de-tinning plants, with an annual capacity of 40,000 tons.

Great shortage of motor oil has caused the Nazi Organisation for Oil and Tar Products in Belgium to seek for a new formula to save fuel. Every saving having been made in other directions it was recently decided to mix tar-oils with gas oil in the proportion 75 per cent. gas oil to 25 per cent. benzol washed oil. But the proportion of tar-oil was not enough and the percentage has, therefore, had to be increased. The later order includes the following formula: 60 per cent. imported gas oil and 40 per cent. tar-oil composed of 50 per cent. dephenolised middle oil and 50 per cent. dephenolised benzol washed oil, both by-products of coal.

Forthcoming Events

A meeting of the Midland section of the **Institution of the Rubber Industry** will be held on **April 29,** when Dr. D. Parkinson will read a paper on " The Effect of Diameter and Surface Area of Carbon Black Particles on Certain Properties of Rubber Compounds."

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

JOHN REID AND SON (OIL DISTILLERS), LTD., Horbury Bridge. (M., 17/4/43.) Satisfaction, March 25, of debentures registered July 8, 1941, to the extent of £3500.

SKUSE AND CO., LTD., London, N.W., manufacturing chemists. (M., 17/4/43.) Satisfaction, March 25, of debenture registered November 5, 1938.

Company News

British Tar Products, Ltd., announce an interim dividend of 4 per cent. (same).

British Lead Mills, Ltd., announce a dividend for the year to October 31, 1942, of 10 per cent. (nil).

British Emulsifiers, Ltd., announce an interim dividend on the ordinary shares of 5 per cent. (nil).

Beecham's Pills, Ltd., announce a dividend of 16 per cent. (14½ per cent.), making 30 per cent. for the year (28½ per cent.).

Metal Salts, Ltd., 16 Newgate Street, Chester, have increased their nominal capital by the addition of £10,000 beyond the registered capital of £20,000.

Indestructible Paint, Ltd., announce a final ordinary dividend of 17½ per cent., making 25 per cent. (20 per cent.), for 1942, and a net profit of £46,766 (£37,400).

Pinchin Johnson and Co., Ltd., announce a net profit for 1942 of £183,121 (£130,859), and a final ordinary dividend of 6 per cent., making 8½ per cent. (same).

Lacrinoid Products, Ltd., announce a net profit for 1942 of £5523 (£6207), and a final dividend of 5 per cent., making 9 per cent. (same).

The Eastern Chemical Co., Ltd., announce a profit (subject to taxation) for the year ended March 31, 1942, of £19,524 (£20,566), £16,000 of this is set aside to cover taxation (U.K. and India).

Imperial Chemical Industries, Ltd., announce a final ordinary dividend for 1942 of 5 per cent., making 8 per cent. (same), and a net profit of £6,499,859 (£6,162,212).

Chemical and Allied Stocks and Shares

THE volume of business in Stock Exchange markets showed some improvement earlier in the week, and sentiment has tended to benefit from the fact that the Budget proposals were in line with general expectations. Imperial Chemical at 39s. 3d. were firm and virtually the same as a week ago, the increase in profits indicated by the preliminary statement being regarded as a good achievement, bearing in mind the weight of taxation and other factors arising from the war. Moreover, the impression is that profits are struck on a conservative basis. Maintenance of the dividend at 8 per cent., which was in accordance with expectations, permits a transfer of £601,595 to war contingency reserve, and £100,000 is set aside for the creation of a war personnel reserve, while the balance carried forward is increased from £865,487 to £965,499. Lever & Unilever at 35s. 3d. were within 3d. of the level ruling a week ago; Lever N.V. improved from 30s. to 30s. 6d. United Glass Bottle Manufacturers' shares were firm at 60s. on consideration of the financial results, which show that the 12 per cent. distribution is again a conservative payment; actual earnings on the shares last year were equivalent to 20⅞ per cent., but £50,000 was added to reserve. It may be noted that many important companies connected with the chemical and kindred industries are following the policy of placing a large proportion of their profits to reserve funds. This building up of strong finances to meet the difficulties of the eventual change-over from war conditions to peace-time production should, of course, prove to the ultimate benefit of shareholders. Moreover, as mentioned previously in these notes, there is at the present time a tendency for the strength of the balance-sheet position of individual companies to have as important a part in governing the market price of shares as the question of the immediate dividend yield.

Pinchin Johnson shares were higher at 32s. 3d. xd., compared with 31s. 6d. a week ago. Profits for 1942 record a strong improvement, but this is another instance where shareholders gain no immediate benefit, the payment again being limited to 8½ per cent., which, however, allows

£60,000 to be placed to contingencies reserve, and the balance carried forward is increased by £17,430 to £169,202. Indestructible Paint shares were higher and changed hands up to 107s. 6d. on the increased profits and the raising of the total distribution from 20 per cent. to 25 per cent. Greeff-Chemicals 5s. ordinary were 7s. 3d., and Monsanto Chemicals 5½ per cent. preference 22s. 6d. Imperial Smelting held their recent rise to 14s., and General Refractories were firm at 16s. 1½d. British Aluminium improved slightly to 49s. 6d., and British Match held their improvement to 38s. 7½d. Moreover, Birmid Industries were higher at 85s. 3d., and B. Laporte remained firm at 78s. British Plaster Board did not keep best prices made in the past few days, but at 28s. 6d. were 3d. better on balance. Stewarts & Lloyds deferred showed firmness at 54s; Tube Investments were slightly higher at 93s. 9d. Triplex Glass strengthened to 31s. 10½d., and Turner & Newall to 75s. On the other hand, United Molasses were lower at 28s. 4½d. the tendency being to await the forthcoming dividend announcement. Lacrinoid Products 2s. shares changed hands around 4s. 4½d. following publication of the results and the chairman's annual statement. Dealings in Erinoid 5s. shares were again around 11s. 6d.; British Industrial Plastics 2s. shares were 5s. 10½d. British Xylonite 5 per cent. preference shares held the rise to 24s. 6d., which, following the recent publication of the financial results; the last business reported in the ordinary shares was at 52s. 6d. In respect of 1942 the dividend on the latter has again been limited to 10 per cent. In other directions, British Oxygen moved up to 76s. 9d. Boots Drug 5s. ordinary remained at 41s. 6d. There was a firmer tendency in leading oil shares.

British Chemical Prices

Market Reports

CONDITIONS on the general chemicals market during the past week have been fairly active with most sections displaying a strong undertone. Delivery specifications to the chief consuming industries have covered good quantities and supplies are being maintained on steady lines. On the whole new business in heavy chemicals has been on a moderate scale and prices generally remain firm. In the soda products market there is a steady demand for chlorate of soda, caustic soda and refined nitrate of soda. Soda ash has also attracted a fair amount of attention, while Glauber salt and salt cake are in brisk demand. Most of the potash chemicals are available in restricted quantities with nominal prices ruling for yellow prussiate of potash. All grades of borax and boric acid and acetic acid are in good call and in other directions there is a continued heavy demand for glycerine, white powdered arsenic and formaldehyde. In the coal-tar products market a ready outlet is reported for most items and the pressure for deliveries of carbolic acid and cresylic acid is maintained. The benzoles, xyloles and toluols continue in good demand and a steady business is reported in refined tar.

MANCHESTER.—Fresh inquiry and a moderate volume of actual new business has been reported on the Manchester chemical market during the past week. With one or two exceptions, industrial users of chemicals in Lancashire and the West Riding of Yorkshire, including the textile and allied industries, are taking steady contract deliveries and specifications are circulating regularly week by week. The ammonia and soda compounds generally are good features of the trade in this area, and there is also a steady demand for the acids. In the by-products market, crude and refined tar, creosote oil, cresylic acid, and most of the light distillates are going well into consumption.

GLASGOW.—In the Scottish heavy chemical trade there has been an improvement during the past week for home business. Export trade remains very limited. Prices continue firm.

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